

WHAT IS CLAIMED IS:

1. A method for detecting lymph nodes in a human, comprising:
introducing a fluorescent contrast agent into a lymphatic system of a
body;
5 directing time-varying excitation light into the tissue of the body;
causing the time-varying excitation light to contact a lymph node of
the lymphatic system, whereby a time-varying emission light is generated;
detecting the time-varying emission light at a surface of the body;
filtering the time-varying emission light to reject excitation light re-
10 emitted from the lymph node; and
imaging the lymph node of the lymphatic system.
2. The method of Claim 1, wherein introducing the fluorescent contrast
agent comprises introducing indocyanine green ("ICG").
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3. The method of Claim 1, wherein directing time-varying excitation light
into the tissue of the body comprises directing time-varying excitation light into the
tissue of the body with a light source selected from the group consisting of a pulse, a
series of pulses, pseudo random modulation, sinusoidally modulated light, and a
20 square wave.
4. The method of Claim 1, wherein generated time-varying emission light
comprises a spatial distribution selected from the group consisting of a spherical
wave, a planar wave, a series of lines of illumination, concentric circles of
25 illumination, and a ronchi rule pattern.
5. The method of Claim 1, further comprising modulating the intensity of
the excitation light to obtain a wavelength between approximately 700 nm and 900
nm.

6. The method of Claim 1, wherein causing the excitation light to contact a lymph node of the lymphatic system comprises causing the excitation light to contact a sentinel lymph node of the lymphatic system.

7. A system for detecting lymph nodes in a human, comprising:
a laser diode operable to direct time-varying near-infrared excitation
light into the tissue of a body;

5 an image intensifier operable to detect, at a surface of the body, a
redshifted and time-varying emission light generated by the near-infrared
time-varying excitation light contacting a lymph node of the lymphatic
system;

one or more optical filters operable to reject excitation light re-emitted
from the lymph node; and

10 an imaging apparatus operable to image the lymph node of the
lymphatic system.

8. The system of Claim 7, further comprising a fluorescent contrast agent
adapted to be injected into a lymphatic system of a body, the fluorescent contrast
15 agent selected from the group consisting of a non-specific fluorescent contrast agent
and a specific fluorescent contrast agent.

9. The system of Claim 7, wherein the near-infrared time-varying
excitation light is selected from the group consisting of a spherical wave, a planar
20 wave, a series of lines of illumination, concentric circles of illumination, and a ronchi
rule pattern.

10. The system of Claim 7, further comprising a frequency generator to
modulate the intensity of the near-infrared time-varying excitation light to obtain a
25 wavelength between approximately 700 nm and 900 nm.

11. The system of Claim 7, wherein the one or more optical filters are
selected from the group consisting of a band pass filter, a long pass filter, and a
holographic notch filter.

12. The system of Claim 7, wherein the one or more optical filters comprises any combination of the following filters: a band pass filter, a long pass filter, and a holographic notch filter.

5 13. The system of Claim 7, wherein the lymph node of the lymphatic system comprises a sentinel lymph node.

14. The system of Claim 7, wherein the imaging device is a charge coupled device camera.

15. A method for detecting lymph nodes in a human, comprising:
introducing a fluorescent contrast agent into a lymphatic system of a
body;
directing into the tissue of the body near-infrared time-varying
excitation light modulated to obtain a wavelength between approximately 700
nm and 900 nm;
causing the near-infrared time-varying excitation light to contact a
sentinel lymph node of the lymphatic system, whereby a redshifted and time-
varying emission light is generated;
detecting the generated time-varying emission light at a surface of the
body;
optically filtering the generated time-varying emission light to reject
excitation light re-emitted from the sentinel lymph node;
quantitizing a fluorescence characteristic throughout at least a portion
of the sentinel lymph node from the generated time-varying emission light by
establishing a number of values with a processor, each of the values
corresponding to a level of the fluorescence characteristic at a different
position within the sentinel lymph node, the level of the fluorescence
characteristic varying with a composition of the sentinel lymph node; and
imaging the sentinel lymph node in accordance with the values.

16. The method of Claim 15, wherein introducing the fluorescent contrast
agent comprises introducing indocyanine green ("ICG").

17. The method of Claim 15, wherein directing into the tissue of the body
near-infrared time-varying excitation light comprises directing into the tissue of the
body time-varying excitation light with a light source selected from the group
consisting of a pulse, a series of pulses, pseudo random modulation, sinusoidally
modulated light, and a square wave.

18. The method of Claim 15, wherein the fluorescence characteristic corresponds to at least one of fluorescence lifetime, fluorescence quantum efficiency, fluorescence yield, and fluorescence uptake.

5 19. The method of Claim 15, wherein quantitizing a fluorescence characteristic further comprises determining the values from a mathematical relationship modeling light scattering behavior of the portion of the sentinel lymph node.

10 20. The method of Claim 19, wherein the mathematical relationship corresponds to a diffusion equation approximation of multiply scattered light.

21. A method of lymph node analysis of humans, comprising:
exposing a lymph node to an excitation light with a pre-determined
time varying intensity, the lymph node multiply scattering the excitation light;
detecting a multiply scattered light emission from the lymph node in
5 response to said exposing;
determining a number of values from the emission with a processor,
the values each corresponding to a level of a fluorescence characteristic at a
different position within the lymph node, the level of the characteristic varying
with lymph node composition; and
10 generating an image of lymph node compositional variation in
accordance with the values.

22. The method of Claim 21, wherein exposing the lymph node to an
excitation light comprises exposing the lymph node to a near-infrared time-varying
15 excitation light.

23. The method of Claim 21, wherein the fluorescence characteristic
corresponds to at least one of fluorescence lifetime, fluorescence quantum efficiency,
fluorescence yield, and fluorescence uptake.